Economics Information

Ontario

ECONOMICS OF HAY PRODUCTION IN ONTARIO, 1979

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ONTARIO MINISTRY OF AGRICULTURE AND FOOD
LEGISLATIVE BUILDINGS, TORONTO, ONTARIO, M7A 1E6

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This report is the result of the cooperation of a number of dairy and beef farmers across Ontario who voluntarily provided information on the costs and management programs used in producing their hay forage crops. Extension personnel in each county where the study was conducted supplied a list of potential cooperators and gave assistance throughout the year to assure a successful conclusion to the field work.

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ECONOMICS INFORMATION

ECONOMICS OF HAY PRODUCTION IN ONTARIO, 1979

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SUMMARY AND CONCLUSIONS

Hay is an important crop in all areas of Ontario, accounting for 34 percent of the 3.4 million hectares of principal field crops in 1979.

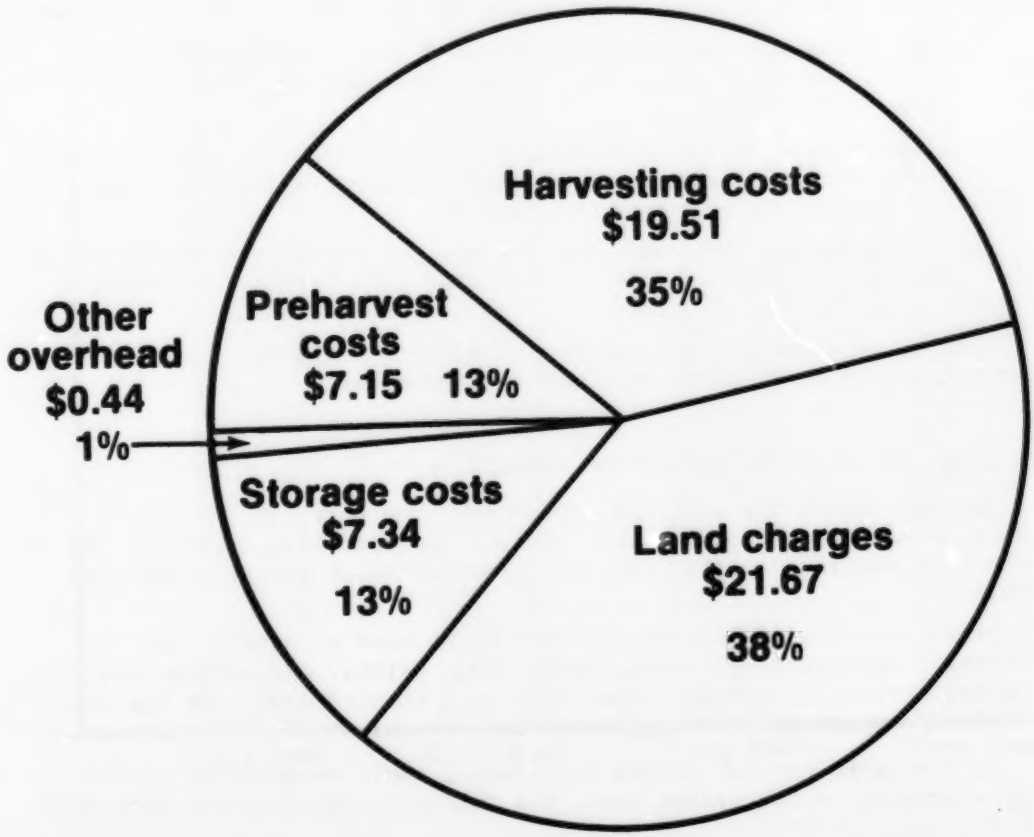
While the total area of hay produced on Ontario farms declined, average yields increased at a steady rate over the twenty-year period from 1960 to 1979. In this period the five-year average yields for Ontario increased by over 20 percent, from 4.8 to 5.8 t/ha.

Increased yields occurred through better management practices and because of the realization by dairy and beef farmers that the production of high quality hay leads to reduced cash feed purchases

HAY PRODUCTION COSTS

Hay production costs were averaged for all producers studied (Figure 1). Preharvest and harvest costs together accounted for 48 percent of total costs per tonne, while land, storage, and overhead amounted to 52 percent of the total.

Figure 1. Hay Production Costs per Tonne for All Farms, Hay Study, Ontario, 1979



HAY PRODUCTION COSTS AND PRACTICES BY REGION IN ONTARIO

An analysis of hay production for all those cooperating in the study — 44 dairy and 25 beef farmers — showed the following:

1. The average yield per hectare of harvested hay was 6.47 t at 85 percent dry matter (DM), crude protein (CP) was 838 kg on a 100 percent dry matter basis.

2. Measurable costs per hectare were $362.85 for all cooperators; total costs were $56.11 per tonne; and the cost of crude protein was 43¢ per kilogram.

3. Harvesting costs per tonne were consistent across all areas, ranging from $19.08 in central Ontario, to $19.60 in western Ontario, and $19.74 per tonne in eastern Ontario.

HAY PRODUCTION COSTS AND PRACTICES BY FARM TYPE IN ONTARIO

Measurable costs for beef farms averaged $42.78 per tonne in the Western region, $54.88 per tonne in the Central region, and $51.49 per tonne in the Eastern region. Correspondingly, dairy farms' measurable costs averaged $57.09 per tonne in the Western region, $64.70 per tonne in the Central region, and $57.50 per tonne in the Eastern region.

Overall, beef farmers produced hay for $48.93 per tonne, and dairy farmers for $59.50 per tonne, yet the cost of producing crude protein was the same (43¢/kg for beef farmers and 44¢/kg for dairy farmers). This equality resulted because dairy farmers produced hay with both higher yields per hectare and with higher crude protein content per tonne.

In each study area the average yields of hay harvested per hectare were higher on the dairy farms than on the corresponding beef farms in the same study area (Figure 2).

Dairy producers harvested more crude protein than did beef producers, with the greatest difference occurring in eastern Ontario, where the yield amounted to over 80 percent more per hectare.

In the important first cut, the average dairy producer obtained a higher yield per hectare of 5.08 t containing 14.1 percent CP, compared with 4.97 t containing 12.0 percent CP for all beef producers.

Dairy producers in all areas harvested more hectares of second and third cut hay on their farms than did beef producers.

ESTABLISHMENT COSTS AND HARVESTING METHODS

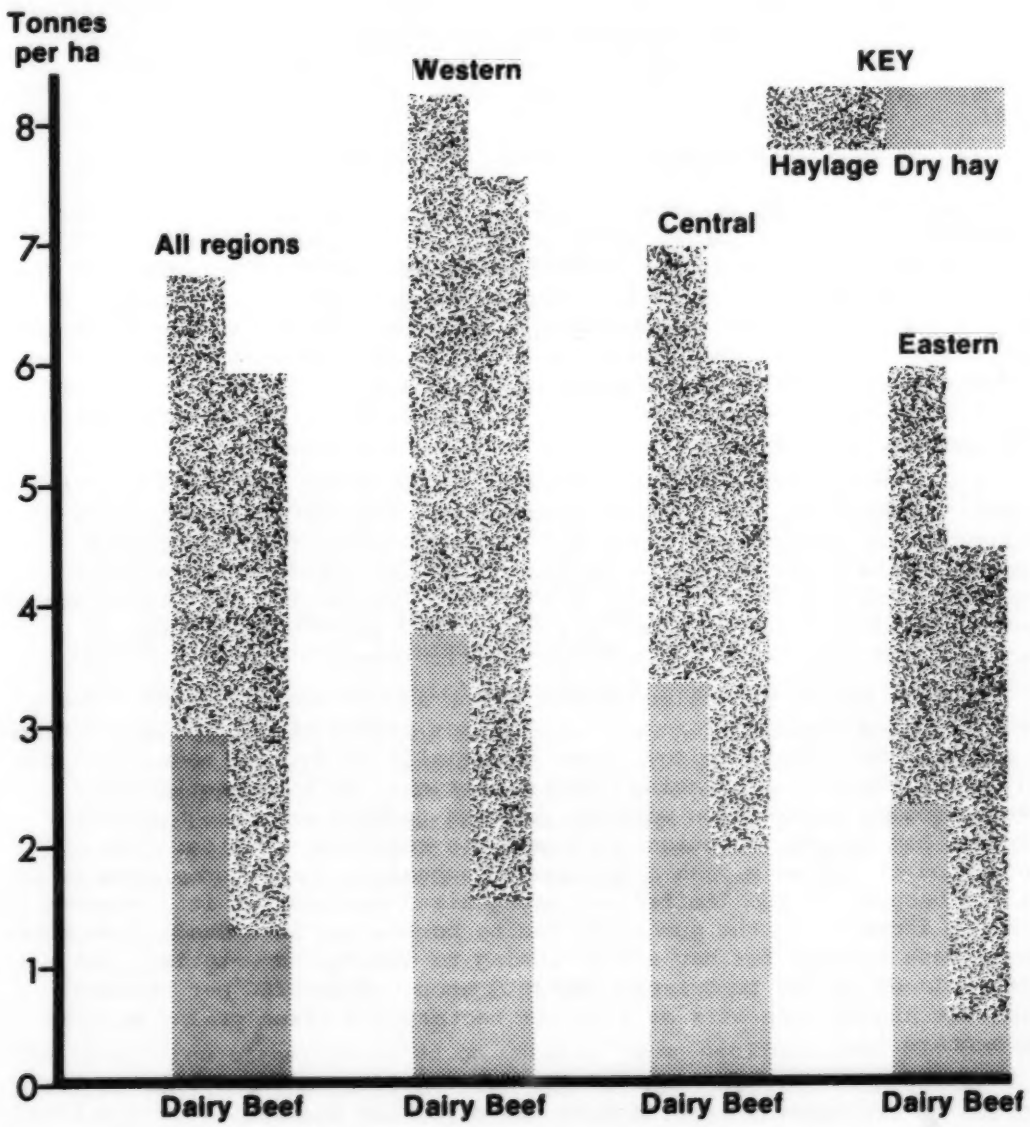
Establishment costs for a direct seeded hay crop were $207.53 per hectare, consisting of $157.74 per hectare for operating costs and $49.79 per hectare for fixed costs, with no allowance being made for land use costs.

There are three major harvesting methods used by Ontario hay producers: conventional baling, large round baling, and haylage systems. Other hay harvesting methods being used on a limited scale are the loose hay stacking and large rectangular baling methods.

In comparing hay harvesting costs among those cooperating in the study according to the system used, the following observations were made:

	Per tonne	
	Harvesting labor	*Total costs*
	hours	dollars
Conventional baler	1.7	21.22
Large round baler	.8	15.95
Haylage	.6	16.51

Figure 2. Hay Yields per Hectare, by Farm Type for All Regions, Hay Study, Ontario, 1979



HAY PRODUCTION IN ONTARIO

IMPORTANCE TO ONTARIO AGRICULTURE

The production of hay at 1.14 million hectares accounted for 34 percent of Ontario's 3.36 million hectares of major field crops grown in 1979. Of the three study areas, hay production in eastern Ontario accounted for 60 percent of the area devoted to field crop production. In comparison, only 34 percent of western Ontario's field crop area was in hay production (Table 1). The increased production of such cash crops as grain corn and soybeans, made possible by improved drainage and new cultural practices, has occurred at the expense of areas of hay, pasture, and spring grain crops across Ontario.

A well-managed hay forage system is an important part of a profitable livestock operation. Successful farmers have realized the importance of quality hay in providing protein for the production of milk and beef. Purchased feed costs amount to 16 percent of the total costs in dairy production and 7 percent in beef production. Therefore, the production of good quality hay, high in crude protein, will reduce off-farm feed purchases and thus lower the total production costs.

Because of the expansion of corn crops across Ontario, many farmers have relegated their hay crops to the poorer grades of soil on their farms. In areas of Ontario where row crops, especially corn, have been grown for many years, farmers are facing yield reductions, soil compaction, and severe erosion. Extension workers and some farmers are recognizing the value of hay in crop rotations to assist in soil conservation. The production of hay as a cash crop has not appealed to cash crop growers in Ontario because of the limited and unorganized markets for it. However, with the increase in the number of riding horses and in demands from other areas, cash markets for hay are beginning to develop in Ontario. The values placed on hay in Ontario for 1979 amounted to $286 per hectare, which was higher than oats at $239 per hectare and mixed grains at $265 per hectare.[1]

At the Ontario Forage Conference held in 1978, the chairman in his address to the general session made the following comments:

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[1] *Agricultural Statistics for Ontario, 1979*, Publication 20, (Toronto: Ontario Ministry of Agriculture and Food, 1980).

Table 1. Hay Area in Relation to Major Field Crops by Region of Ontario, 1979

Crop	Ontario total	Regions of Ontario: South-ern	West-ern	Cent-ral	East-ern	North-ern
		'000 hectares				
Winter wheat	198	141	34	20	2	x
Oats	164	40	24	30	48	22
Barley	136	30	63	17	15	11
Mixed grain	320	33	217	38	23	9
Grain corn	757	396	235	77	49	..
Silage corn	328	83	137	45	61	2
Soybeans	283	270	9	3	1	..
White beans	34	10	24	..	..	..
Hay	1141	154	381	198	299	109
Total	3361	1157	1124	428	498	153
		percent				
Hay, % of total	34	13	34	46	60	71

x = less than one thousand hectares.

Source: *Agricultural Statistics for Ontario, 1979*, Publication 20, (Toronto: Ontario Ministry of Agriculture and Food, 1980).

During the 60's and early 70's, corn was emphasized and rightly so. Corn is a highly successful crop. So successful, that in many cases, forage was relegated to second class or occasionally completely forgotten. But now farmers in all parts of Ontario where corn is grown are talking about yield reductions, compaction, erosion, persistent weeds and other problems associated with corn monoculture. These same farmers are talking about rotations, soil conservation and forages.

The chairman further stated the uses of good forage.

Farmers have realized for many years the value of forages in providing protein for production of milk. No additional protein need be provided for cows milking 60 to 70 pounds[1] *daily if they are eating sufficient forage testing 20 percent protein on a dry matter basis. It is most satisfying to see beef producers now rediscovering the potential of forages for them.*

TRENDS IN ONTARIO HAY PRODUCTION

The total area of hay produced on Ontario farms declined over the twenty-year period from 1960 to 1979. This decline did show some tendency to level off at 1.1 to 1.2 million hectares over the period 1970 to 1979 (Table 2). The area of hay production was still declining in eastern

[1]Metric equivalent is 27 to 32 kg.

Table 2. Area and Yield of Hay for All Ontario and Three Regions, 1960 to 1979

Year	Ontario		Western		Central		Eastern	
	ha	t/ha	ha	t/ha	ha	t/ha	ha	t/ha
	'000		'000		'000		'000	
1979	1141	6.3	380	6.5	198	6.0	299	5.8
1978	1153	5.6	382	5.8	194	5.4	304	5.2
1977	1111	6.1	362	6.0	190	5.6	299	6.0
1976	1154	5.7	377	6.0	195	5.6	304	5.4
1975	1141	5.4	352	6.0	184	4.9	291	4.5
1974	1125	5.2	355	5.5	186	5.0	291	4.7
1973	1117	5.8	378	6.0	200	5.4	294	5.4
1972	1094	5.8	359	6.1	187	6.2	279	4.9
1971	1095	5.4	357	5.8	186	5.5	283	5.3
1970	1214	5.7	388	6.0	200	5.9	312	5.4
1969	1275	6.1	405	6.7	213	5.9	329	5.8
1968	1315	5.5	418	5.6	222	5.6	340	5.4
1967	1392	5.8	438	6.3	239	6.0	353	5.4
1966	1383	5.2	432	5.6	237	5.1	354	4.6
1965	1368	4.0	390	4.7	210	4.0	307	2.3
1964	1358	4.6	389	5.1	212	4.9	322	3.3
1963	1348	4.9	393	5.2	214	4.7	323	4.6
1962	1338	4.4	409	4.6	218	4.1	331	4.2
1961	1328	5.2	414	5.2	220	5.4	332	5.2
1960	1376	3.8	397	5.1	230	5.1	359	4.4
5-year average:								
1975-79	1130	5.8	371	6.1	192	5.5	299	5.4
1970-74	1129	5.5	367	5.9	192	5.6	292	5.1
1965-69	1324	5.3	417	5.8	224	5.3	337	4.8
1960-64	1315	4.8	400	5.1	218	4.8	334	4.3

Source: *Agricultural Statistics for Ontario, 1979*, Publication 20, (Toronto: Ontario Ministry of Agriculture and Food, 1980).

Ontario, while the area for central and western Ontario was levelling off. During the twenty-year period from 1960 to 1979, the area of hay production in eastern Ontario fell steadily by 60 000 hectares or 17 percent. In the same period, hay production in both central and western Ontario did not experience such a rapid reduction, being 4 percent in the western area and 14 percent in central Ontario (Table 2).

The yields per hectare increased at a steady rate over the twenty-year period from 1960 to 1979. The five-year average yields for Ontario hay production have increased by over 20 percent from 4.8 to 5.8 t/ha during the period 1960-79. Eastern Ontario experienced the greatest yield increase at 26 percent, from an average of 4.3 to 5.4 t/ha. In comparison, yield increases amounted to 20 percent in the western area and 15 percent in the central area of Ontario during the five-year periods from 1960 to 1979 (Table 2).

Although the area of hay production in Ontario has been on the decline, the increased yields per hectare have maintained total production at over 6.5 million tonnes in recent years.[1] Increased yields per hectare have occurred through better management practices and because of the realization by dairy and beef farmers that the production of high quality hay reduces their need for cash feed purchases.

Through the recommendations of the Ontario Forage Committee, a coordinated program has been established for upgrading forage crops in Ontario. The Ontario Forage Crops Committee consists of two subcommittees — one on production and one on variety evaluation. Members of these committees represent all aspects of forage production, including research, extension, industry, and farming organizations. Because of the efforts of these committees, research is under way at various institutions across Ontario to improve the production of forage crops. These research programs include, among many others, evaluations of forage varieties, forage seed production studies, winter hardiness studies with alfalfa, and forage management studies. A complete list of forage research projects in Ontario is available in the *Inventory of Agricultural Research Projects*, published by the Education, Research and Special Services Division of the Ontario Ministry of Agriculture and Food, Toronto, Ontario.

HAY PRODUCTION SYSTEMS USED IN ONTARIO

A hay production system may vary from area to area or even from farm to farm, but it should contain the following items for each farm:

1. an establishment method for seedbed preparation and seedings;
2. stand management;
3. a harvest method, or methods; and
4. storage facilities to coincide with the harvesting methods.

The successful establishment of a hay crop sets the pattern for a top producing crop in succeeding years. In recent years, through the introduction of new forage varieties, improved weed-controlling sprays, and better cultural practices, the direct seeding of a legume or of a legume and grass mixture has proven to be successful. Further on in this report a section is devoted to the practices used by a selected sample of growers who provided information on the inputs and the costs of establishing a direct seeded hay crop.

Once a stand of hay has been established, good management practices must be carried out each year to assure maximum production. Several good references are available on the management of the hay crop in Ontario, and these are listed in the reference section at the back of this report.

HARVESTING METHODS FOR FORAGES

There are many harvesting methods available to Ontario farmers, and no one harvesting method is suitable for all farms. Each method needs to be

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[1] *Agricultural Statistics for Ontario, Metric Edition, 1941-1978*, (Toronto: Ontario Ministry of Agriculture and Food, 1980).

adapted to each individual livestock operation as well as to the available labor, capital, and managerial abilities of each farm operator. In fact, many Ontario farmers use at least two methods to harvest their hay forage. In this study, no attempt has been made to cover all the hay harvesting methods available to Ontario farmers. The three harvesting methods used by those participating in the study were conventional baling, large round baling, and haylage.

These and the other major hay harvesting methods available to Ontario farmers can be summarized as follows:

1. Conventional baling system — This consists of a windrower (or mower), a conditioner, a rake, a baler, and a tractor. Various extras have been added to this system to allow for easier handling in loading the bales in the field, and in hauling the bales and unloading them into storage. These consist of bale stookers, automatic bale ejectors and bale wagons, bale stackers, and various types of unloading elevators and bale carriers extending into the storage area.

2. Large round baling system — It consists of a windrower (or mower), a conditioner, a rake, a roll baler, a bale mover, and a tractor. In most cases, large round bales are stored outside in close proximity to the feeding area. Some farmers have built roof-type shelters in which to store these large round bales.

3. Haylage system — This system consists of a windrower (or mower), a conditioner, a forage harvester, a tractor, forage wagons, a blower, and extra tractors to haul wagons and to operate the silo-filling blower. There are many variations of this equipment, depending on the operator and the extent of its annual use on his farm for haylage and corn silage operations. These variations consist of self-propelled forage harvesters and wagons.

4. Loose hay stacking system — This consists of a windrower (or mower), a conditioner, a stack wagon, a stack mover, and a tractor. This equipment will vary in size, depending on the size of the stack wagon.

5. Large rectangular bales — This system consists of a self-propelled windrower, rakes, a big rectangular baler, and a tractor. For moving bales a tractor is equipped with a front-end loader with a bale grapple fork. It is reported that the outside storage of big rectangular bales is not competitive with other big-package hay harvesting systems. To avoid spoilage, some type of protective covering should be placed over stacks of large rectangular bales stored outside.

ORGANIZATION AND OBJECTIVES

BACKGROUND

The Ontario Forage Crops Committee requested that an economic study be made of hay production in Ontario. This study began in the spring of 1979. Completed hay production records were collected from 69 farmers across

Ontario specializing in dairy, beef, and sheep production. These farmers voluntarily provided information on the costs and management practices involved in the production of their hay forage crops.

AREAS OF STUDY

The farmers producing hay were selected from counties where livestock production is a major enterprise. Extension Branch personnel in each of these counties were notified about the study on the *Economics of Hay Forage Production in Ontario*. Each extension office was then visited, and the details of the study were outlined. Lists of the names of possible cooperators were obtained from each office, and then visits were made to these farmers to seek their assistance. In some cases, the agricultural representative either sent out letters or actually travelled with the fieldman to help him obtain farmers who would cooperate. In all cases, the cooperation and interest of the extension staff and the farmers in each county visited was excellent.

WESTERN ONTARIO

Included were the counties of Huron, Bruce, Grey, Perth, Wellington, Middlesex, and Oxford. Ordinarily in agricultural statistics of Ontario, Middlesex and Oxford counties are considered to be part of southern Ontario. However, because of the importance of livestock in these two counties, they have, in this report, been grouped with the western Ontario counties. The number of completed records include 13 dairy, 7 beef, and 2 sheep farms.

CENTRAL ONTARIO

Studies were made in the counties of Peterborough, Victoria, and Northumberland, and in the Regional Municipality of Durham (former counties of Durham and Ontario). The number of completed records include 11 dairy and 9 beef farms.

EASTERN ONTARIO

Farms were located in the counties of Dundas, Russell, Stormont, and Renfrew, and in the Regional Municipality of Ottawa-Carleton. Records were completed for 20 dairy farms, 6 beef farms, and 1 sheep farm.

STUDY OBJECTIVES

A study of hay forage production was conducted on Ontario livestock farms to:

1. determine production costs, yields, quality, and management practices in three areas of Ontario;

2. examine the differences in production costs, yields, quality, and management practices on dairy and beef farms on an area basis;

3. analyze the top one-third of the dairy farms to provide information on their costs and management practices for use in farm management by extension workers and other interested personnel; and

4. present information on the costs involved in seedbed preparation and in the direct seeding of a hay forage crop, as well as a comparison of the costs involved in the most common methods of harvesting hay in Ontario.

METHODS USED TO DETERMINE COSTS, QUALITY, AND VALUE OF HAY

ACCOUNTING ITEMS

Cooperating farmers were given field sheets on which to record the operations performed, the machinery and materials used, and any other operations and costs involved in producing and harvesting their hay crops. Samples were taken from each cut of hay harvested and were analyzed at the University of Guelph to determine the moisture and crude protein content.

Because of the small number of sheep studies involved, the three sheep records were combined in all summaries with the beef records. The hay forage programs practiced by both the beef and the sheep producers in this study were of a similar type.

LABOR USE AND COSTS

Growers recorded operator labor hours and any unpaid family labor hours used in handling the hay crop. A standard rate of $4.50 per adult equivalent hour was used to determine the cost of this labor. In cases where children (under 16 years) assisted in the hay harvest, their labor hours were converted to equivalent adult labor hours. This conversion was based on the conviction that a child can adequately replace an adult in the harvesting operation. All costs for hired labor, including any employee benefits, were recorded at the amounts actually paid. No charge for allowance to management was included in the cost of the hay production. In this study any allowance to management comes from the returns to risk and management that result after all the measurable costs have been deducted from the total crop value of the hay harvested.

TRACTOR, MACHINERY, AND CUSTOM WORK COSTS

Tractor, machinery, and truck costs include: depreciation; interest on investment; repairs and maintenance; gas, oil, and grease; insurance; licenses for trucks; and housing. Since some equipment was used for custom work and other farm operations, expenses were allocated according to its estimated total annual use and the amount of its use on the hay crop. Hired custom work and machine rentals were charged at actual costs.

MATERIALS

The total cost for such materials as fertilizer, sprays, and twine used on the current 1979 hay crop were charged at their actual cost. The cost

for hay seed mixtures and other material used at the time of seeding on each hay field in the study was prorated according to the number of years each field remained in sod.

Manure applied to each hay field before harvesting began was charged to the hay crop according to the type of manure and the period of application. The value of the manure was calculated by applying the spring 1979 fertilizer nutrient prices to the available nutrients. The values for manure charged to the hay crops in the study were as follows:

	Time & value of application	
	Fall & winter	*Spring*
Cattle:		
Solid	$1.18/t	$1.67/t
Liquid, undiluted	$1.42/1000 L	$2.00/1000 L
Swine & sheep:		
Solid	$0.79/t	$1.28/t
Liquid, undiluted	$0.95/1000 L	$1.54/1000 L
Poultry:		
Solid	$3.28/t	$4.37/t
Liquid, undiluted	$3.94/1000 L	$5.25/1000 L

LAND USE COSTS

Land use costs include taxes, rent, and interest on investment for owned land used in hay production. The value of the land was based on an average agricultural productive value for all owned land under study. Interest on owned land was calculated at 10.82 percent, which was the average rate charged for new mortgages by the *Farm Credit Corporation* for 1979. The amount of nontaxable items such as tile loan charges and the *Ontario Farm Tax Rebate*, if applicable, were deducted from the total tax bill in order to arrive at the net taxes paid.

BUILDING OR STORAGE COSTS

The costs for on-farm storage barns and silos include interest, depreciation, insurance, and an allowance for repairs and maintenance. Present values were placed on these storage buildings after the field staff had made an assessment based on the size, age, and current condition of the buildings, the quantity of hay stored, and if known, the original construction costs.

The annual cost for the storage buildings was based on the determined present value as follows:

Item	*Percent*
Interest, the average Farm Credit Corporation rate for new mortgages for 1979	10.82
Depreciation, frame buildings:	
20 years & under	5.00
Over 20 years	2.50
Insurance	0.50
Repairs & maintenance, frame buildings:	
20 years & under	1.50
Over 20 years	3.00
Repairs & maintenance, concrete & glass-lined	0.25

OTHER COST ITEMS

For this study, other cost items included produce insurance and interest on operating costs. Because of the difficulty in determining the exact cost of produce insurance, an estimated cost was used for each farm in the study. This estimate was based on the tonnage of hay stored and its value at a rate of $36/t. The insurance rate was taken at 45¢ per $100 of stored hay. For those farms where large round bales were stored outside, no insurance was assessed to the crop.

Interest on operating capital was charged to the hay crop at the rate of 13 percent per annum for a four-month period. Operating capital included the cost of seed, fertilizer, sprays, and all preharvest hired labor, custom work, or machine rentals.

HAY YIELD AND QUALITY

Baled hay yields were calculated on the number of bales harvested and the average weight per bale. Haylage yields were determined from silo measurements and the use of silo capacity tables. In a limited number of cases, forage wagon loads were weighed as a double check on haylage yields.

The total crop of hay harvested is equal to the yields, calculated at 85 percent dry matter from all the cuts of dry hay and haylage, divided by the number of hectares of hay in the study. Complete details on the average yields obtained per cut for haylage and dry (baled) hay are given in the Appendix tables.

In order to establish a measure of quality, samples were collected from each cut of haylage and dry hay and were analyzed at the University of Guelph to determine their moisture and crude protein content. From this analysis, the total amount of crude protein produced on a 100 percent dry matter basis was calculated for each farm in the study.

HAY VALUE

Many livestock farmers are becoming increasingly aware of the advantages of producing and using a high quality hay forage to provide all or most of the protein required in animal production. Therefore, in this hay study, an attempt was made to relate hay value to quality, specifically to its protein content.

An assumed standard of analysis for hay was taken at 12 percent crude protein. Using the monthly values for hay in Ontario,[1] an average value per tonne was calculated for the feeding months of October 1979 to March 1980 inclusive. This value amounted to $48.15/t.

Using guidelines from information prepared by the American Forage and

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[1] *Monthly Crop and Livestock Report*, (Toronto: Economics Branch, Ontario Ministry of Agriculture and Food).

Grassland Council (AFGC) Hay Marketing Task Force,[1] the following table of values was set up to show hay values in relation to protein content.

Crude protein analysis % on a dry matter basis	*Hay values per tonne 85% dry matter*
9	39.90
10	42.65
11	45.40
12	48.15
13	50.90
14	53.65
15	56.40
16	59.15
17	61.90
18	64.65
19	67.40
20	70.15
21	72.90

AFTERMATH YIELD AND VALUE

The utilization of the hay crop for aftermath pasture by livestock is practiced on beef and dairy farms across Ontario. This practice occurs on fields where second and third cuts of hay are not required for stored feed and where fencing exists. Because of the lack of adequate fencing and for certain management considerations, many livestock producers do not make use of aftermath pasture.

Good forage management practices do not recommend that either pure alfalfa or hay mixtures containing alfalfa be pastured. If pastures are required, suitable pasture mixtures should be used. Hay fields that are to be plowed up can be used as aftermath or auxiliary pasture without harm being done to the alfalfa stand.

Those cooperators who made use of aftermath pasture from one or all of their hay fields provided details on the number and size of the animals pastured, as well as the number of days on pasture. No information was collected on the costs of fencing, of providing a water supply, or of moving the cattle to and from the fields concerned. These costs could be considered as being offset by the costs of harvesting and of hauling the hay to storage. For each mature cow on pasture, a daily allowance of 11 kg of hay at 85 percent dry matter was made. In making this allowance, adjustments were made for the various animal units according to the size of the cattle or sheep on pasture, and on the basis of other considerations such as supplementary feeding.

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[1] D.A. Rohweder, R.F. Barnes, and Neal Jorgenson, "The Use of chemical analyses to establish hay standards," in proceedings of *First International Symposium on Feed Composition, Animal Nutrient Requirements, and Computerization of Diets*, held July 11-16, 1976, at Utah State University, Logan, Utah, edited by Paul V. Fonnesbeck, Lorin E. Harris, and Leonard C. Kearl, pp. 249-57, (Logan, Utah: Utah State University, 1978).

For each cooperator who reported the use of aftermath pasture, the aftermath hay yield was valued according to the average crude protein content of all on-farm harvested hay. No allowance was made for aftermath hay not pastured. Therefore, the aftermath hay yield for those reporting its use is shown separately and was not considered as part of the yield of harvested hay.

RETURNS TO RISK AND MANAGEMENT

Returns to risk and management refers to the amount remaining after all the measurable costs, including an allowance for operator labor and family labor and for interest on investment, have been deducted from the gross returns. It is a return over and above the wage allowance to the farm operator for his management, his risk, and any other unmeasurable costs involved in the production of the hay crop. No allowance was made for the farm operator's managerial ability in this study.

ANALYSIS OF HAY PRODUCTION COSTS IN ONTARIO

RESULTS OF STUDY

BY REGION

All dairy and beef farms in the study were grouped together to present a comparison between the different areas of the Province where the study was conducted. For this study, three regions of the Province were covered: western, central, and eastern Ontario. The counties included in these regions are outlined in the section *Areas of Study* on page 9.

The total crop value per hectare varied from $318.38 in eastern Ontario to $491.48 in western Ontario. The average crop value per hectare for all producers in the study was $380.09. With average measurable costs of $362.85/ha, returns to risk and management showed a net gain of $17.24 (Table 3).

The average size of the hay enterprise on the study farms was largest in eastern Ontario at 39 ha, with the central and western areas at 32 ha and 25 ha respectively (Table 3).

Yields per hectare of harvested hay ranged from 5.56 t in the eastern area to 6.62 t in central Ontario and 8.00 t in the western area. The yields for all growers in each area, with the exception of eastern Ontario, were lower but still followed the trends shown in the study (Tables 2 and 3). This same yield trend occurs not only for each cut of hay but also for the haylage and dry hay harvested in each cut (Appendix Table 1).

There are many factors that contribute to hay yields, such as climatic conditions, soil types, and management practices, including the varieties used, the number of years the fields are left in sod, the number

Table 3. Hay Production Costs and Returns by Region of Ontario, 1979

	All farms	Western	Central	Eastern
No. of farms	69	22	20	27
Hectares per farm	32	25	32	39
Harvesting labor (h/t)	1.2	1.0	1.0	1.5
YIELD PER HECTARE				
Harvested @ 85% DM (tonnes):				
Total crop[a]	6.47	8.00	6.62	5.56
Aftermath pasture	0.18	0.12	0.29	0.35
CRUDE PROTEIN				
Average percent	15.3	16.5	15.5	14.1
Kilograms per hectare	838	1125	870	667
Kilograms per tonne	153	165	155	141
Cost per kilogram (¢)	43	36	47	47
COSTS AND RETURNS				
Per hectare:		dollars		
Hay harvested	370.04	484.39	382.75	299.66
Aftermath pasture	10.05	7.09	16.95	18.72
Total crop value	380.09	491.48	399.70	318.38
Measurable costs	362.85	407.42	407.34	311.83
Ret. to risk & management	17.24	84.06	-7.64	6.55
Per tonne:				
Hay harvested	57.22	60.53	57.78	53.92
Aftermath pasture	1.55	0.89	2.56	3.37
Total crop value	58.77	61.42	60.34	57.29
Measurable costs	56.11	50.92	61.49	56.11
Ret. to risk & management	2.66	10.50	-1.15	1.18

[a]Total crop yield per hectare is equal to the sum of the yields from all the cuts of dry hay and haylage divided by the number of hectares of hay in the study. See Appendix Table 1 for details on yields per hectare.

of cuts harvested, and fertility practices. In this study it was impossible to measure the effect of many of these factors, but some measurements and observations were made. With few exceptions, 1979 was a favorable hay production year in the three study areas. The average hay yield for all of Ontario at 6.3 t/ha was the highest ever recorded. Similarly, the average yields for each study area in 1979 were either at or close to previous record production (Table 2).

In each area of Ontario, maximum hay yields are affected by two important factors: variations in climate and variations in soil conditions. For example, in most parts of western Ontario, because of earlier spring growth, farmers are able to begin their hay harvest at an earlier period than growers in either central or eastern Ontario. These western Ontario growers have the opportunity for an earlier harvest of the first cut, thus allowing more time for second and third cuts to grow and be harvested.

Table 4. Hay Production Costs per Tonne by Region of Ontario, 1979

	All farms	Western	Central	Eastern
No. of farms	69	22	20	27
Hectares per farm	32	25	32	39
Yield per hectare, (tonnes)	6.47	8.00	6.62	5.56
FERTILIZER NUTRIENT USE				
Kilograms per hectare:				
Nitrogen (N)	5	6	3	6
Phosphate (P)	28	34	30	23
Potash (K)	44	40	72	29
Total	77	80	105	58
PREHARVEST COSTS		dollars per tonne		
Labor	0.12	0.10	0.12	0.14
Tractor & machinery	0.23	0.16	0.24	0.28
Materials:				
Seed	2.00	2.28	1.55	2.13
Fertilizer	4.17	3.96	5.85	3.86
Manure	0.50	0.12	0.63	0.69
Other	0.01	..	..	0.02
Total	6.68	5.36	8.03	6.70
Other	0.12	0.13	0.23	0.03
TOTAL	7.15	5.75	8.62	7.15
HARVESTING COSTS				
Labor:				
Operator	2.99	2.49	2.65	3.63
Hired	2.14	2.20	1.77	2.36
Total	5.13	4.69	4.42	5.99
Tractor	5.39	5.61	5.65	5.03
Machinery	7.19	7.02	7.24	7.27
Materials	0.86	0.90	0.72	0.92
Other	0.94	1.38	1.05	0.53
TOTAL	19.51	19.60	19.08	19.74
OVERHEAD COSTS				
Land	21.67	19.90	24.97	20.60
Storage	7.34	5.25	8.37	8.18
Other	0.44	0.42	0.45	0.44
TOTAL	29.45	25.57	33.79	29.22
TOTAL COSTS PER TONNE	56.11	50.92	61.49	56.11

Many livestock farms in central and eastern Ontario have areas on their farms that are not suited to corn production because of inadequate drainage and topography. For these reasons, these fields are often left in sod for many years, which limits alfalfa production and allows the grasses to predominate in the hay stand. A high percentage of grasses in a hay field limits the amount of regrowth for second and third cuttings and the amount of crude protein.

Table 5. Hay Production Costs and Returns, Western Ontario, 1979

	All farms	Dairy		Beef
		Top 1/3	All	
No. of farms	22	4	13	9
Hectares per farm	25	31	23	28
Harvesting labor (h/t)	1.0	0.9	1.0	1.0
YIELD PER HECTARE				
Harvested @ 85% DM (tonnes):				
Total crop[a]	8.00	9.36	8.39	7.54
Aftermath pasture	0.12	..	..	0.26
CROUDE PROTEIN				
Average percent	16.5	18.8	17.7	15.0
Kilograms per hectare	1125	1490	1262	963
Kilograms per tonne	165	187	177	150
Cost per kilogram (¢)	36	34	38	34
COSTS AND RETURNS				
Per hectare:		dollars		
Hay harvested	484.39	624.58	535.47	425.45
Aftermath pasture	7.09	..	..	14.42
Total crop value	491.48	624.58	535.47	439.87
Measurable costs	407.42	508.83	479.01	322.71
Ret. to risk & management	84.06	115.75	56.46	117.16
Per tonne:				
Hay harvested	60.53	60.63	63.82	56.40
Aftermath pasture	0.89	..	..	1.91
Total crop value	61.42	60.63	63.82	58.31
Measurable costs	50.92	49.39	57.09	42.78
Ret. to risk & management	10.50	11.24	6.73	15.53

[a]Total crop yield per hectare is equal to the sum of the yields from all the cuts of baled hay and haylage divided by the number of hectares of hay in the study. See Appendix Table 2 for details on yields per hectare.

Some livestock producers, in order to assure an adequate supply of hay at average or low yield levels, have expanded their area of hay production. Therefore, in years of above average yields, there is an excess of hay, and they do not require the total production from all their hay fields and all cuts. On the other hand, good managers make full utilization of their hay crops through the use of efficient management practices, which assure them better than average yields and less fluctuation in total production.

Hay production costs and returns by region for all the farms in the study are shown in Table 4. In order to provide helpful information to other farmers, a summary of the hay production costs and growing practices of the top one-third of the dairy farm producers in each study area have been summarized in Tables 5-10. These top producers were selected on their ability to harvest a high yield containing a high average crude

Table 6. Hay Production Costs per Tonne, Western Ontario, 1979

	All farms	Dairy		Beef
		Top 1/3	All	
No. of farms	22	4	13	9
Hectares per farm	25	31	23	28
Yield per hectare (tonnes)	8.00	9.36	8.39	7.54
FERTILIZER NUTRIENT USE				
Kilograms per hectare:				
Nitrogen (N)	6	2	8	3
Phosphate (P)	34	29	36	32
Potash (K)	40	41	39	41
Total	80	72	83	76
		dollars per tonne		
PREHARVEST COSTS				
Labor	0.10	0.04	0.11	0.06
Tractor & machinery	0.16	0.09	0.22	0.08
Materials:				
Seed	2.28	2.12	2.33	2.21
Fertilizer	3.96	1.23	2.66	3.35
Manure	0.12	..	..	0.28
Other	..	..	..	..
Total	6.36	3.35	4.99	5.84
Other	0.13	0.02	0.12	0.15
TOTAL	6.75	3.50	5.44	6.13
HARVESTING COSTS				
Labor:				
Operator	2.49	2.02	2.57	2.38
Hired	2.20	1.64	2.50	1.82
Total	4.69	3.66	5.07	4.20
Tractor	5.61	6.11	6.58	4.33
Machinery	7.02	6.84	7.50	6.38
Materials	0.90	0.88	0.98	0.80
Other	1.38	..	1.55	1.16
TOTAL	19.60	17.49	21.68	16.87
OVERHEAD COSTS				
Land	19.90	18.74	23.12	15.66
Storage	5.25	9.38	6.44	3.67
Other	0.42	0.28	0.40	0.45
TOTAL	25.57	28.40	29.96	19.78
TOTAL COSTS PER TONNE	51.92	49.39	57.08	42.78

protein content. For each area a comparison is made with all the farms in the study, with all the dairy farms, with the top one-third of the dairy farms, and with all the beef farms. The top one-third of the beef farms were not included for each study area because the small numbers involved would not provide statistically sound data.

Table 7. Hay Production Costs and Returns, Central Ontario, 1979

	All farms	Dairy		Beef
		Top 1/3	All	
No. of farms	20	4	11	9
Hectares per farm	32	20	37	26
Harvesting labor (h/t)	1.0	1.1	1.1	1.0
YIELD PER HECTARE				
Harvested @ 85% DM (tonnes):				
Total crop[a]	6.62	9.02	6.97	6.01
Aftermath pasture	0.29	0.23	0.30	0.28
CRUDE PROTEIN				
Average percent	15.5	18.4	16.3	13.8
Kilograms per hectare	870	1408	965	703
Kilograms per tonne	155	156	163	138
Cost per kilogram (¢)	47	38	47	47
COSTS AND RETURNS				
Per hectare:		dollars		
Hay harvested	382.75	592.80	418.08	319.10
Aftermath pasture	16.95	14.88	17.88	15.12
Total crop value	399.70	607.68	435.96	334.22
Measurable costs	407.34	532.38	451.11	329.82
Ret. to risk & management	-7.64	75.30	-15.15	4.40
Per tonne:				
Hay harvested	57.78	65.75	59.97	53.10
Aftermath pasture	2.56	1.65	2.56	2.52
Total crop value	60.34	67.40	62.53	55.62
Measurable costs	61.49	59.05	64.70	54.88
Ret. to risk & management	-1.15	8.35	-2.17	0.74

[a]Total crop yield per hectare is equal to the sum of the yields from all the cuts of baled hay and haylage divided by the number of hectares of hay in the study. See Appendix Table 3 for details on yields per hectare.

The information presented in Tables 5-10 shows that for each region it is possible to attain above average yields containing a high crude protein content. The amount of crude protein produced per hectare is important to livestock producers who wish to reduce their cash requirements for feed purchases. This fact is most important for dairy producers. The production of hay containing a high crude protein content may not be as important to beef producers, who are interested in the production of roughage for use in cow-calf feeding operations. For these producers, a consistently high crude protein content would be advantageous prior to calving and during the nursing period.

In all areas, the top one-third of the dairy producers consistently produced more kilograms of crude protein per hectare than did the average of all the dairy farms in the study in each area. This amounted to over 40 percent more in both central and eastern Ontario, while the top

Table 8. Hay Production Costs per Tonne, Central Ontario, 1979

	All farms	Dairy		Beef
		Top 1/3	All	
No. of farms	20	4	11	9
Hectares per farm	32	20	37	26
Yield per hectare (tonnes)	6.62	9.02	6.97	6.01
FERTILIZER NUTRIENT USE				
Kilograms per hectare:				
Nitrogen (N)	3	0	4	1
Phosphate (P)	30	44	43	7
Potash (K)	72	39	70	74
Total	105	83	117	82
PREHARVEST COSTS		dollars per tonne		
Labor	0.12	0.10	0.11	0.14
Tractor & machinery	0.24	0.09	0.25	0.19
Materials:				
Seed	1.55	1.30	1.48	1.69
Fertilizer	5.85	4.28	6.64	4.25
Manure	0.63	1.61	0.74	0.39
Other	..	..	..	..
Total	8.03	7.19	8.86	6.33
Other	0.23	0.16	1.22	0.23
TOTAL	8.62	7.54	9.44	6.89
HARVESTING COSTS				
Labor:				
Operator	2.65	3.06	2.52	2.93
Hired	1.77	1.68	1.94	1.43
Total	4.42	4.74	4.46	4.36
Tractor	5.65	5.25	6.46	3.98
Machinery	7.24	5.61	7.94	5.82
Materials	0.72	0.83	0.66	0.85
Other	1.05	1.74	1.47	0.20
TOTAL	19.08	18.17	20.99	15.21
OVERHEAD COSTS				
Land	24.97	22.88	24.92	25.05
Storage	8.37	9.96	8.88	7.31
Other	0.45	0.50	0.47	0.42
TOTAL	33.79	33.34	34.27	32.78
TOTAL COSTS PER TONNE	61.49	59.05	64.70	54.88

producers in the western region produced 18 percent more crude protein per hectare (Tables 5, 7, and 9). The high crude protein production achieved by these producers in each region is reflected in the high return to risk and management per hectare compared with the average of all dairy producers (Tables 5, 7, and 9).

Table 9. Hay Production Costs and Returns, Eastern Ontario, 1979

	All farms	Dairy		Beef
		Top 1/3	All	
No. of farms	27	7	20	7
Hectares per farm	39	45	37	42
Harvesting labor (h/t)	1.5	1.5	1.6	1.4
YIELD PER HECTARE				
Harvested @ 85% DM (tonnes):				
Total crop[a]	5.56	7.51	5.99	4.49
Aftermath pasture	0.35	0.16	0.38	0.26
CRUDE PROTEIN				
Average percent	14.1	16.9	15.0	11.1
Kilograms per heetare	667	1079	765	423
Kilograms per tonne	141	169	150	111
Cost per kilogram (¢)	47	39	45	54
COSTS AND RETURNS				
Per hectare:		dollars		
Hay harvested	299.66	462.64	337.64	204.88
Aftermath pasture	18.72	9.98	21.55	11.89
Total crop value	318.38	472.62	359.19	216.77
Measurable costs	311.83	424.25	344.19	230.97
Ret. to risk & management	6.55	48.37	15.00	-14.20
Per tonne:				
Hay harvested	53.92	61.63	56.40	45.67
Aftermath pasture	3.37	1.33	3.60	2.65
Total crop value	57.29	62.96	60.00	48.32
Measurable costs	56.11	56.52	57.50	51.49
Ret. to risk & management	1.18	6.44	2.50	-3.17

[a]Total crop yield per hectare is equal to the sum of the yields from all the cuts of baled hay and haylage divided by the number of hectares of hay under study. See Appendix Table 4 for details on yields per hectare.

In all areas the top one-third of the dairy producers had a lower cost per tonne of hay harvested than did all dairy farms on study. This difference in costs per tonne amounted to $0.98 in the eastern region, $5.65 in central Ontario, and $7.69 in western Ontario (Tables 6, 8, and 10). Similarly, harvesting costs per tonne were also lower for the top growers. Increased yields combined with efficient handling were the major reason for the lower costs per tonne shown by the top one-third of the producers.

In almost all cases, the top one-third of the dairy producers harvested larger quantities of both haylage and/or baled hay for each cut of hay than did the average for all dairy producers. Similarly, the average crude protein content of the hay harvested by the top producers was either equal or higher for each cut of haylage or baled hay than for the average producer (Appendix Tables 2, 3, and 4).

Table 10. Hay Production Costs per Tonne, Eastern Ontario, 1979

	All farms	Dairy		Beef
		Top 1/3	All	
No. of farms	27	7	20	7
Hectares per farm	39	45	37	42
Yield per hectare (tonnes)	5.56	7.51	5.99	4.49
FERTILIZER NUTRIENT USE				
Kilograms per hectare:				
Nitrogen (N)	6	8	8	2
Phosphate (P)	23	36	29	7
Potash (K)	29	55	37	10
Total	58	99	74	19
PREHARVEST COSTS		dollars per tonne		
Labor	0.14	0.18	0.16	0.05
Tractor & machinery	0.28	0.49	0.34	0.06
Materials:				
Seed	2.13	1.93	2.28	1.64
Fertilizer	3.86	5.20	4.47	1.85
Manure	0.69	0.21	0.62	0.92
Other	0.02	0.04	0.02	..
Total	6.70	7.38	7.39	4.41
Other	0.03	0.04	0.04	..
TOTAL	7.15	8.09	7.93	4.52
HARVESTING COSTS				
Labor:				
Operator	3.63	3.04	3.56	3.87
Hired	2.36	2.48	2.62	1.52
Total	5.99	5.52	6.18	5.39
Tractor	5.03	6.82	5.24	3.30
Machinery	7.27	7.73	7.81	5.47
Materials	0.92	0.79	0.92	0.93
Other	0.53	0.44	0.52	0.57
TOTAL	19.74	21.30	20.97	15.66
OVERHEAD COSTS				
Land	20.60	16.36	19.11	25.58
Storage	8.18	10.28	9.00	5.47
Other	0.44	0.49	0.49	0.26
TOTAL	29.22	27.13	28.60	31.31
TOTAL COSTS PER TONNE	56.11	56.52	57.50	51.49

Those top dairy producers in each study area who combined high harvested hay yields with a high crude protein content had the following factors in common:

1. Total costs per tonne were lower than those for all dairy producers. Harvesting costs were lower or equal, as the top producers made efficient use of tractors and machines.

Table 11. Hay Production Costs and Returns of Dairy Farms by Region of Ontario, 1979

	All farms	Western	Central	Eastern
No. of farms	44	13	11	20
Hectares per farm	33	23	37	37
Harvesting labor (h/t)	1.3	1.0	1.0	1.6
YIELD PER HECTARE				
Harvested @ 85% DM (tonnes):				
Total crop[a]	6.76	8.39	6.97	5.99
Aftermath pasture	0.28	..	0.30	0.38
CRUDE PROTEIN				
Average percent	16.1	17.7	16.3	15.0
Kilograms per hectare	924	1262	965	765
Kilograms per tonne	161	177	163	150
Cost per kilogram (¢)	44	38	47	45
COSTS AND RETURNS				
Per hectare:		dollars		
Hay harvested	401.58	535.47	418.08	337.64
Aftermath pasture	16.63	..	17.88	21.55
Total crop value	418.21	535.47	435.96	359.19
Measurable costs	402.09	479.01	451.11	344.19
Ret. to risk & management	16.12	56.46	-15.15	15.00
Per tonne:				
Hay harvested	59.42	63.82	59.97	56.40
Aftermath pasture	2.46	..	2.56	3.60
Total crop value	61.88	63.82	62.53	60.00
Measurable costs	59.50	57.09	64.70	57.50
Ret. to risk & management	2.38	6.73	-2.17	2.50

[a]Total crop yield per hectare is equal to the sum of the yields from all the cuts of dry hay and haylage divided by the number of hectares of hay under study. See Appendix Table 5 for details on yields per hectare.

2. A larger percentage of second and third cuts of hay were harvested.

3. More hay was harvested as haylage than as baled hay.

4. The hay fields under study were in their first or second year of production.

5. Seed mixtures were alfalfa based, and pure stands of alfalfa were used by many growers.

6. Recommended management practices were used, such as timely cutting when the hay was at its proper maturity, and the use of a good rotation, plowing up fields when the amount of alfalfa in the stand began to disappear.

Table 12. Hay Production Costs per Tonne of Dairy Farms by Region of Ontario, 1979

	All farms	Western	Central	Eastern
No. of farms	44	13	11	20
Hectares per farm	33	23	37	37
Yield per hectare (tonnes)	6.76	8.39	6.97	5.99
FERTILIZER NUTRIENT USE				
Kilograms per hectare:				
Nitrogen (N)	7	8	4	8
Phosphate (P)	34	36	43	29
Potash (K)	47	39	70	37
Total	88	83	117	74
PREHARVEST COSTS		dollars per tonne		
Labor	0.13	0.11	0.11	0.16
Tractor & machinery	0.28	0.22	0.25	0.34
Materials:				
Seed	2.06	2.33	1.48	2.28
Fertilizer	4.64	2.66	6.64	4.47
Manure	0.50	..	0.74	0.62
Other	0.01	..	..	0.02
Total	7.21	4.99	8.86	7.39
Other	0.11	0.12	0.22	0.04
TOTAL	7.73	5.44	9.44	7.93
HARVESTING COSTS				
Labor:				
Operator	3.00	2.57	2.52	3.56
Hired	2.39	2.50	1.94	2.62
Total	5.39	5.07	4.46	6.18
Tractor	6.08	6.58	6.46	5.54
Machinery	7.77	7.50	7.94	7.81
Materials	0.86	0.98	0.66	0.92
Other	1.06	1.55	1.47	0.52
TOTAL	21.16	21.68	20.99	20.97
OVERHEAD COSTS				
Land	21.83	23.13	24.92	19.11
Storage	8.31	6.44	8.88	9.00
Other	0.47	0.40	0.47	0.49
TOTAL	30.61	29.97	34.27	28.60
TOTAL COSTS PER TONNE	59.50	57.09	64.70	57.50

BY FARM TYPE

All dairy and beef farms in the study were separated to present a comparison between each farm type by study area across Ontario (Tables 11 to 14).

Because of their higher harvested yields and higher average crude protein content, the dairy farms in each area showed a considerably higher

Table 13. Hay Production Costs and Returns of Beef Farms by Region of Ontario, 1979

	All farms	Western	Central	Eastern
No. of farms	25	9	9	7
Hectares per farm	31	28	26	42
Harvesting labor (h/t)	1.1	1.0	1.0	1.4
YIELD PER HECTARE				
Harvested @ 85% DM (tonnes):				
Total crop[a]	5.92	7.54	6.01	4.49
Aftermath pasture	0.27	0.26	0.28	0.26
CRUDE PROTEIN				
Average percent	13.5	15.0	13.8	11.1
Kilograms per hectare	680	963	703	423
Kilograms per tonne	135	150	138	111
Cost per kilogram (¢)	43	34	47	54
COSTS AND RETURNS				
Per hectare:		dollars		
Hay harvested	309.73	425.45	319.10	204.88
Aftermath pasture	13.91	14.42	15.12	11.89
Total crop value	323.64	439.87	334.22	216.77
Measurable costs	289.88	322.71	329.82	230.97
Ret. to risk & management	33.76	117.16	4.40	-14.20
Per tonne:				
Hay harvested	52.28	56.40	53.10	45.67
Aftermath pasture	2.35	1.91	2.52	2.65
Total crop value	54.63	58.31	55.62	48.32
Measurable costs	48.93	42.78	54.88	51.49
Ret. to risk & management	5.70	15.53	0.74	-3.17

[a]Total crop yield per hectare is equal to the sum of the yields from all the cuts of dry hay and haylage divided by the number of hectares of hay under study.

total crop value per hectare than the beef farms of the corresponding area. Although the crude protein content was important to both farm types, dairy farmers were more conscious of producing top quality hay to use in their feeding programs.

In each area, the average yields harvested per hectare were higher on the dairy farms than on the corresponding beef farms in the same area. Dairy farms in the western area harvested a total of 8.39 t/ha compared to 7.54 t/ha for beef farms in the same area. Similar comparisons occurred in the other areas, with dairy producers harvesting nearly 1 t more per hectare in central Ontario and 1.5 t more in eastern Ontario (Tables 11 and 13).

The following conditions occurred on dairy farms in relation to beef farms in the same area:

Table 14. Hay Production Costs per Tonne of Beef Farms by Region of Ontario, 1979

	All farms	Western	Central	Eastern
No. of farms	25	9	9	7
Hectares per farm	31	28	26	42
Yield per hectare (tonnes)	5.92	7.54	6.01	4.49
FERTILIZER NUTRIENT USE				
Kilograms per hectare:				
Nitrogen (N)	2	3	1	2
Phosphate (P)	15	32	7	7
Potash (K)	39	41	74	10
Total	56	76	82	19
PREHARVEST COSTS		dollars per tonne		
Labor	0.09	0.06	0.14	0.05
Tractor & machinery	0.11	0.08	0.19	0.06
Materials:				
Seed	1.89	2.21	1.69	1.64
Fertilizer	3.18	3.35	4.25	1.85
Manure	0.50	0.28	0.39	0.92
Other	..	..	..	..
Total	5.57	5.84	6.33	4.41
Other	0.13	0.15	0.23	..
TOTAL	5.90	6.13	6.89	4.52
HARVESTING COSTS				
Labor:				
Operator	2.97	2.38	2.93	3.87
Hired	1.61	1.82	1.43	1.52
Total	4.58	4.20	4.36	5.39
Tractor	3.93	4.33	3.98	3.30
Machinery	5.95	6.38	5.82	5.47
Materials	0.86	0.80	0.85	0.93
Other	0.70	1.16	0.20	0.57
TOTAL	16.02	16.87	15.21	15.66
OVERHEAD COSTS				
Land	21.34	15.66	25.05	25.58
Storage	5.28	3.67	7.31	5.47
Other	0.39	0.45	0.42	0.26
TOTAL	27.01	19.78	32.78	31.31
TOTAL COSTS PER TONNE	48.93	42.78	54.88	51.49

1. With few exceptions, higher yields of both haylage and dry hay were harvested by dairy producers.

2. The average dairy farmer cooperating in the study across Ontario harvested 924 kg of crude protein or 36 percent more per hectare than the 680 kg harvested by beef producers (Tables 11 and 13). In all areas, dairy producers harvested more crude protein per hectare than did beef

producers in the area. The greatest difference occurred in eastern Ontario where this difference amounted to over 80 percent more per hectare.

3. The average dairy farm had higher harvesting machine costs of $14.91/t for tractor, machines, and other (custom work) than did the average beef farm at $10.58/t. These higher harvesting machine costs on dairy farms occurred across all the study regions (Tables 12 and 14).

The greater tractor and machine costs can be partially explained in that most dairy farms had two sets of harvesting machines. That is, they had a baler and bale handling equipment as well as a forage harvester and forage handling equipment. Also, it was observed that the average dairy producer had newer hay harvesting equipment than did the average beef farmer in the study.

HAY PRODUCTION PRACTICES

INPUTS USED AND COSTS OF ESTABLISHING A DIRECT SEEDED HAY CROP

During the calls on the farms cooperating in the hay study, additional information was collected on the inputs and operations used in the establishment of direct seeded hay crops. Eleven hay study cooperators provided information on the inputs they used, the operations they performed and the costs involved in the establishment of their direct seeded crops of hay. The average area established by this seeding method was ten hectares per farm.

Total costs, variable plus fixed, amounted to $207.53 per hectare. Variable costs including materials, tractor and machine repairs, maintenance and fuel, custom work, hired labor, and interest on operating costs were $157.74/ha or 76 percent of the total establishment costs (Table 15). Fixed costs, comprised of interest, depreciation, insurance, and housing for tractors and machines, and an allowance for operator labor were $49.79/ha or 24 percent of the establishment costs (Table 15). No allowance was made for land use costs.

Forty-three hectares or 39 percent of the direct seeded land was seeded to a pure alfalfa stand. The average amount of seed used was 16.8 kg/ha at a cost of $89.89/ha (Table 16).

Nine of the 11 farms used a direct application of fertilizer when seeding their forage crop. On the average, they applied 271 kg/ha containing 16 kg of N, 73 kg of P, and 79 kg of K, or a ratio of about 1.0:4.6:4.9 (Table 16). According to the latest crop recommendations, the growers followed good practices in establishing their direct seeded crops of hay.

Table 15. Cost per Hectare for Establishing a Direct Seeded Crop of Hay, Ontario, 1979[a]

	Dollars per hectare, weighted average
No. reporting	11
Hectares per farm	10
VARIABLE COSTS	dollars[b]
Materials:	
Seed, 15.7 kg	84.42
Fertilizer, N=11 kg, P=55 kg, K=59 kg, total=125 kg	34.69
Sprays	5.78
Total	124.89
Tractor, repairs & maintenance, fuel & oil:	
Seedbed	9.74
Planting	2.03
Total	11.77
Machinery, repairs & maintenance, fuel & oil:	
Seedbed	1.46
Planting	2.69
Total	4.15
Custom work:	
Seedbed	7.29
Planting	2.96
Hired labor:	
Seedbed	0.54
Planting	0.25
Interest on operating costs, 13% for 4 months	5.89
TOTAL	157.74
FIXED COSTS	
Tractor, interest, depreciation, insurance, housing:	
Seedbed	13.52
Planting	2.69
Total	16.21
Machinery, interest, depreciation, insurance, housing:	
Seedbed	11.93
Planting	6.13
Total	18.06
Labor, operator:	
Seedbed	10.80
Planting	4.72
TOTAL	49.79
TOTAL VARIABLE AND FIXED COSTS	207.53

[a] No allowance in this table has been made for land use charges.

[b] To convert:
$/ha to $/acre, multiply by 0.4047;
kg/ha to lbs./acre, multiply by 0.8929.

Table 16. Inputs Used for Establishing a Direct Seeded Crop of Hay on 11 Farms, Ontario, 1979

LABOR USE	h/ha[a]
Seedbed preparation:	
Hired	0.5
Operator	2.5
Total	3.0
Planting:	
Hired	0.2
Operator	1.0
Total	1.2

SEED USED	No. of farms	Hectares seeded	kg/ha[a]	$/ha[a]
Alfalfa, pure	4	43	16.8	89.89
Alfalfa & timothy:				
Alfalfa			12.2	
Timothy			2.7	
Total	4	37	14.9	84.26
Alfalfa & others:				
Alfalfa			9.9	
Clovers			0.7	
Grasses			4.4	
Total	3	30	15.0	65.51
All records:				
Alfalfa			12.0	
Timothy			1.5	
Brome			0.6	
Other			1.7	
Total	11	110	15.8	81.42

FERTILIZER USE	Farms using fertilizer	All farms
No. of farms	9	11
Hectares	82	110
Nutrients per hectare (kg):		
Nitrogen	16	11
Phosphate	73	55
Potash	79	59
Total	168	125
Fertilizer per hectare:		
Kilograms	271	203
Dollars	46.31	34.69

SPRAYS, HERBICIDE		
No. of farms	3	11
Hectares	33	110
Dollars per hectare	19.35	5.78

[a]To convert: hours and $/ha to hours and $/acre, multiply by 0.4047; kg/ha to lb./acre, multiply by 0.8929.

HAY HARVESTING METHODS USED BY COOPERATING GROWERS

The growers participating in the study used one or more the following hay harvesting methods: conventional baling, haylage, large round baling. There were 62 of the 69 growers who used the conventional baling system to harvest either all or part of their hay crop. Of these 62, 13 dairy farms and 14 beef farms used conventional baling as the only method of harvesting their hay crop.

		Harvesting method used			
Farm type	*All growers*	*Conventional baling*	*Large round baling*	*Haylage*	*Haylage & baling*
Dairy	44	13	-	2	29
Beef	25	14	4	1	6
Total	69	27	4	3	35

Three cooperators completed their harvest by use of only a haylage system, while 35 used a combination of baling and haylage in their harvesting operations. Twenty-nine or 66 percent of the dairy farms in the study used a haylage system in their haying operations. In comparison, only 24 percent of the beef producers used haylage in their hay harvest.

In order to harvest quality forage, high in protein content, early cutting and careful handling to reduce leaf loss are essential. Where top production of high quality stored feed is required, researchers have found that a haylage system achieves the desired result. The use of mower-conditioners, windrowing at cutting time or when the forage is tough, and/or storing the crop as silage, are all practices that help retain the leaves.

The use of a haylage system is well suited to dairy operations, where a high quality forage is a good source of protein. Because of weather conditions, it is often difficult to harvest and bale quality hay in early June. By harvesting the first cut of hay as haylage, producers have a better chance of retaining a higher protein level than by baling. Similarly, later on in the season, a third cut may be harvested as haylage when curing conditions are less than ideal for baling. All dairy farmers in the study harvested an average of 39 percent of their hay as haylage. During the first and third cuts, 42 and 75 percent respectively of the harvested hay was handled as haylage. In comparison, only 24 percent of the second cut of hay on the dairy farms was harvested as haylage (Table 17). Second-cut hay is harvested when weather conditions are more suitable to the baling and retention of the protein content in the hay.

Dairy producers have found that a haylage handling system on their farms is useful for the following reasons:

1. It is convenient for dry lot feeding, as the hay is cut and brought to the dairy feedlot during the summer months.

2. It provides a double use of existing silos. The silos can be filled with haylage during late spring and summer periods, and, when the hay has been fed out, the silos can be filled with corn silage for use during the remainder of the feeding period.

3. Because more tonnes of hay and corn forage can be produced, the annual fixed costs of owning forage equipment is spread over a greater number of tonnes, thus reducing the unit cost per tonne.

Table 17. Percentage of the Area of Baled Hay and Haylage Harvested by Farm Type and Cut, 1979

Hay cut	All farms		Dairy farms		Beef farms	
	Baled	Haylage	Baled	Haylage	Baled	Haylage
	percent					
First	67	33	58	42	83	17
Second	81	19	76	24	93	7
Third	38	62	25	75	84	16
Total[a]	69	31	61	39	86	14

[a]Totals are weighted averages and represent the percentages of either baled or haylage out of the total area of hay harvested from all cuts.

For those dairy and beef farms not equipped with haylage handling and storage facilities, a conventional baling system was used. Eighty-six percent of the hay harvested on the beef farms in the study was handled as baled hay. Most beef producers were more interested in producing a hay crop as a source of roughage in their feeding program.

There were no dairy farms studied that used large round bales, but there were five beef operations that used large round bales in their feeding program. The use of a large round baling system is well suited to one-person beef operations. Using the large round baler and a bale-carrying trailer, one person can readily bale and transport the bales from the field to a storage area near the feedlot. The bales can be stored outside and moved easily into the feeding area as needed. The use of the large round baling system can result in reduced labor and storage requirements.

Of the three hay harvesting methods studied, the haylage method required the least number of labor hours per tonne at 0.6 h. In comparison, the conventional hay harvesting method required 1.7 h/t or just over twice as many labor hours ad the 0.8 h/t for the large round baling method (Table 18). This order and ratio of labor hours per tonne is very similar to an unpublished report by W.J. Dillon on *The Economics of Hay Harvesting Systems in Ontario for 1975 and 1976*. In this report, labor hours for harvesting were 2.0 h/t for conventional balers, 1.0 h/t for large round balers, and 0.9 h/t for the haylage method.

A COMPARISON OF HAY HARVESTING COSTS

Harvesting costs included all the labor, tractor, machine, and twine costs required to harvest, haul, and unload the dry hay and/or haylage into storage. The harvesting costs per tonne for conventional balers at $21.22 were 33 percent greater than the $15.95 required for big bales and 28 percent greater than the $16.51 per tonne for haylage (Table 18).

Table 18. Hay Harvesting Costs per Tonne by Harvesting Systems, Ontario, 1979

	Conventional balers	Large round balers	Haylage
No. of farms	56	5	37
Tonnes harvested per farm	138	184	145
Labor hours per tonne[a]:			
Hired	0.8	0.1	0.2
Operator	0.9	0.7	0.4
Total	1.7	0.8	0.6
Tractor hours per tonne[b]	0.9	0.6	0.7
HARVESTING COSTS[c]		dollars per tonne	
Labor:			
Hired	3.09	0.30	0.96
Operator	3.77	2.95	1.62
Total	6.86	3.25	2.58
Tractor	5.53	3.52	5.42
Machinery	7.35	7.77	6.34
Custom work	0.12	0.61	2.17
Twine	1.36	0.80	..
Total	21.22	15.95	16.51

[a]To convert hours and $/t to hours and $/ton, multiply by 0.907.

[b]Tractor hours for haylage include allowance for tractor time on silo blower without a full-time attendant.

[c]Harvesting costs include operations and costs involved in the field, plus hauling and unloading into storage.

Labor costs in using the conventional baling method amounted to 32 percent of the harvesting costs compared to 16 percent for haylage and 20 percent for large round baling. The use of tractors, machines, and custom work replaced labor for the haylage harvesting method where these costs were 84 percent of the total. For the large round and conventional baling methods, tractor, machine, and custom work costs were 75 percent and 61 percent respectively. Twine costs made up the remaining 6 percent of harvesting costs for the conventional baling method and 5 percent for large round baling (Table 18).

APPENDIX

Appendix Table 1. Hay Production by Region of Ontario, 1979

	All farms	Western	Central	Eastern
No. of farms	69	22	20	27
Hectares per farm	32	25	32	39
1st cut:				
Haylage	11	8	13	11
Dry	21	17	19	28
2nd cut:				
Haylage	3	3	3	2
Dry	12	15	11	9
3rd cut:				
Haylage	2	1	1	4
Dry	1	2	x	x
TONNES/HECTARE @ 85% DM				
1st cut:				
Haylage	5.72	6.46	6.17	4.88
Dry	4.71	5.29	4.72	4.42
Total	5.05	5.68	5.32	4.55
2nd cut:				
Haylage	3.07	3.97	2.93	2.18
Dry	2.45	2.56	2.48	2.26
Total	2.57	2.81	2.58	2.24
3rd cut:				
Haylage	3.06	3.95	3.39	2.86
Dry	2.51	2.59	2.72	1.81
Total	2.85	3.00	2.91	2.74
TOTAL YIELD HARVESTED	6.47	8.00	6.62	5.56
CRUDE PROTEIN @ 100% DM				
1st cut:				
Haylage (kg/ha)	783	1007	822	604
Avg. % CP	16.1	18.3	15.9	14.6
Dry (kg/ha)	527	624	545	471
Avg. % CP	13.2	13.9	13.6	12.5
2nd cut:				
Haylage (kg/ha)	499	649	523	303
Avg. % CP	19.1	19.2	21.0	16.4
Dry (kg/ha)	375	395	377	347
Avg. % CP	18.0	18.1	17.9	18.1
3rd cut:				
Haylage (kg/ha)	517	675	484	489
Avg. % CP	19.9	20.1	16.8	20.1
Dry (kg/ha)	437	466	445	320
Avg. % CP	20.5	21.1	19.2	20.8
Total crude protein:				
Kilograms per hectare	838	1125	870	667
Kilograms per tonne	153	165	155	141
Average % CP	15.3	16.3	15.5	14.1

x = 0.5 hectares or less.

Appendix Table 2. Hay Production of Dairy and Beef Farms, Western Ontario, 1979

	All farms	Dairy		Beef
		Top 1/3	All	
No. of records	22	4	13	9
Hectares per farm	25	31	23	28
1st cut:				
Haylage	8	8	11	4
Dry	17	23	12	23
2nd cut:				
Haylage	3	20	4	2
Dry	15	10	14	16
3rd cut:				
Haylage	1	..	2	..
Dry	2	..	1	4
TONNES/HECTARE @ 85% DM				
1st cut:				
Haylage	6.46	6.21	6.85	7.85
Dry	5.29	5.84	5.25	5.31
Total	5.68	6.11	6.01	5.72
2nd cut:				
Haylage	3.97	3.41	3.91	4.33
Dry	2.56	3.26	2.82	2.25
Total	2.81	3.31	3.05	2.49
3rd cut:				
Haylage	3.95	..	3.95	..
Dry	2.59	..	2.16	2.75
Total	3.00	..	3.26	2.75
TOTAL YIELD HARVESTED	8.00	9.36	8.39	7.54
CRUDE PROTEIN @ 100% DM				
1st cut:				
Haylage (kg/ha)	1007	972	949	1215
Avg. % CP	18.3	18.4	18.4	18.2
Dry (kg/ha)	624	914	684	577
Avg. % CP	13.9	18.4	15.3	12.8
2nd cut:				
Haylage (kg/ha)	649	572	678	607
Avg. % CP	19.2	19.7	20.4	16.5
Dry (kg/ha)	395	531	450	326
Avg. % CP	18.1	19.2	18.8	17.1
3rd cut:				
Haylage (kg/ha)	675	..	675	..
Avg. % CP	20.1	..	20.1	..
Dry (kg/ha)	466	..	386	495
Avg. % CP	21.1	..	21.0	21.1

Appendix Table 3. Hay Production of Dairy and Beef Farms, Central Ontario, 1979

	All farms	Dairy		Beef
		Top 1/3	All	
No. of farms	20	4	11	9
Hectares per farm	32	20	37	26
1st cut:				
Haylage	13	12	17	8
Dry	19	8	20	18
2nd cut:				
Haylage	3	3	6	..
Dry	11	14	13	9
3rd cut:				
Haylage	1	x	x	1
Dry	x	1	2	1
TONNES/HECTARE @ 85% DM				
1st cut:				
Haylage	6.17	4.77	6.19	6.12
Dry	4.72	5.94	4.81	4.61
Total	5.32	5.26	5.46	5.07
2nd cut:				
Haylage	2.93	4.31	2.93	..
Dry	2.48	4.11	2.70	2.07
Total	2.58	4.15	2.77	2.07
3rd cut:				
Haylage	3.39	3.38	3.38	3.40
Dry	2.72	4.20	2.40	3.68
Total	2.91	4.00	2.46	3.52
TOTAL YIELD HARVESTED	6.62	9.02	6.97	6.01
CRUDE PROTEIN @ 100% DM				
1st cut:				
Haylage (kg/ha)	822	707	866	739
Avg. % CP	15.9	17.5	16.5	14.2
Dry (kg/ha)	545	1010	590	484
Avg. % CP	13.6	20.0	14.5	12.4
2nd cut:				
Haylage (kg/ha)	523	706	523	..
Avg. % CP	21.0	19.3	21.0	..
Dry (kg/ha)	377	614	410	316
Avg. % CP	17.9	17.6	17.9	17.9
3rd cut:				
Haylage (kg/ha)	484	558	558	473
Avg. % CP	16.8	19.4	19.4	16.4
Dry (kg/ha)	445	695	410	553
Avg. % CP	19.2	19.4	20.0	17.7

x = 0.5 hectares or less.

Appendix Table 4. Hay Production of Dairy and Beef Farms, Eastern Ontario, 1979

	All farms	Dairy		Beef
		Top 1/3	All	
No. of farms	27	7	20	7
Hectares per farm	39	45	37	42
1st cut:				
Haylage	11	21	14	3
Dry	28	24	23	39
2nd cut:				
Haylage	2	2	3	..
Dry	9	25	11	4
3rd cut:				
Haylage	4	14	6	..
Dry	x	2	1	..
TONNES/HECTARE @ 85% DM				
1st cut:				
Haylage	4.88	5.24	4.64	8.19
Dry	4.42	4.66	4.68	4.00
Total	4.55	4.93	4.66	4.28
2nd cut:				
Haylage	2.18	2.64	2.18	..
Dry	2.26	2.35	2.26	2.09
Total	2.24	2.38	2.26	2.09
3rd cut:				
Haylage	2.86	3.16	2.86	..
Dry	1.81	1.81	1.81	..
Total	2.74	2.99	2.74	..
TOTAL YIELD HARVESTED	5.56	7.51	5.99	4.49
CRUDE PROTEIN @ 100% DM				
1st cut:				
Haylage (kg/ha)	604	742	593	766
Avg. % CP	14.6	16.7	15.0	11.0
Dry (kg/ha)	471	584	532	369
Avg. % CP	12.5	14.7	13.4	10.8
2nd cut:				
Haylage (kg/ha)	303	471	303	..
Avg. % CP	16.4	21.0	16.4	..
Dry (kg/ha)	347	366	356	282
Avg. % CP	18.1	18.3	18.4	15.8
3rd cut:				
Haylage (kg/ha)	489	542	489	..
Avg. % CP	20.1	20.2	20.1	..
Dry (kg/ha)	320	320	320	..
Avg. % CP	20.8	20.8	20.8	..

x = 0.5 hectares or less.

Appendix Table 5. Hay Production of Dairy Farms by Region of Ontario, 1979

	All farms	Western	Central	Eastern
No. of farms	44	13	11	20
Hectares per farm	33	23	37	37
1st cut:				
Haylage	14	11	17	14
Dry	19	12	20	23
2nd cut:				
Haylage	4	4	6	3
Dry	12	14	13	11
3rd cut:				
Haylage	3	2	x	6
Dry	1	1	2	1
TONNES/HECTARE @ 85% DM				
1st cut:				
Haylage	5.46	6.85	6.19	4.64
Dry	4.82	5.25	4.81	4.68
Total	5.08	6.01	5.46	4.66
2nd cut:				
Haylage	2.93	3.91	2.93	2.18
Dry	2.57	2.82	2.70	2.26
Total	2.66	3.05	2.77	2.26
3rd cut:				
Haylage	3.04	3.95	3.38	2.86
Dry	2.16	2.16	2.40	1.81
Total	2.82	3.26	2.46	2.74
TOTAL YIELD HARVESTED	6.76	8.39	6.97	5.99
CRUDE PROTEIN @ 100% DM				
1st cut:				
Haylage (kg/ha)	761	949	866	593
Avg. % CP	16.4	18.4	16.5	15.0
Dry (kg/ha)	576	684	590	532
Avg. % CP	14.1	15.3	14.5	13.4
2nd cut:				
Haylage (kg/ha)	487	678	523	303
Avg. % CP	19.6	20.4	21.0	16.4
Dry (kg/ha)	402	450	410	356
Avg. % CP	18.4	18.8	17.9	18.4
3rd cut:				
Haylage (kg/ha)	520	675	558	489
Avg. % CP	20.1	20.1	19.4	20.1
Dry (kg/ha)	376	386	410	320
Avg. % CP	20.5	21.0	20.0	20.8
Total crude protein:				
Kilograms per hectare	924	1262	965	765
Kilograms per tonne	161	177	163	150
Average % CP	16.1	17.1	16.3	15.0

x = 0.5 hectares or less.

Appendix Table 6. Hay Production of Beef Farms by Region of Ontario, 1979

	All farms	Western	Central	Eastern
No. of farms	25	9	9	7
Hectares per farm	31	28	26	42
1st cut:				
Haylage	5	4	8	3
Dry	26	23	18	39
2nd cut:				
Haylage	1	2	..	..
Dry	10	16	9	4
3rd cut:				
Haylage	2	..	1	..
Dry	x	4	1	..
TONNES/HECTARE @ 85% DM				
1st cut:				
Haylage	6.99	7.85	6.12	8.19
Dry	4.57	5.31	4.61	4.00
Total	4.97	5.72	5.07	4.28
2nd cut:				
Haylage	4.33	4.33	..	..
Dry	2.18	2.25	2.07	2.09
Total	2.33	2.49	2.07	2.09
3rd cut:				
Haylage	3.40	..	3.40	..
Dry	2.88	2.75	3.68	..
Total	2.96	2.75	3.52	..
TOTAL YIELD HARVESTED	5.92	7.54	6.01	4.49
CRUDE PROTEIN @ 100% DM				
1st cut:				
Haylage (kg/ha)	891	1215	739	766
Avg. % CP	15.0	18.2	14.2	11.0
Dry (kg/ha)	464	577	484	369
Avg. % CP	12.0	12.8	12.4	10.8
2nd cut:				
Haylage (kg/ha)	607	607	..	..
Avg. % CP	16.5	16.5	..	..
Dry (kg/ha)	318	326	316	282
Avg. % CP	17.2	17.1	17.9	15.8
3rd cut:				
Haylage (kg/ha)	473	..	473	..
Avg. % CP	16.4	..	16.4	..
Dry (kg/ha)	503	495	553	..
Avg. % CP	20.5	21.1	17.7	..
Total crude protein:				
Kilograms per hectare	680	963	703	423
Kilograms per tonne	135	150	138	111
Average % CP	13.5	15.0	13.8	11.1

x = 0.5 hectares or less.

REFERENCES

Dillon, W.J. "The Economics of Hay Harvesting Systems in Ontario." Unpublished report prepared for the Economics Branch, Ontario Ministry of Agriculture and Food, Toronto, May 1977.

Madhill, J.E., W.E. Curnoe, and D.W. MacDonald. "Successful Forage Establishment." No. 75-090. Kemptville College of Agricultural Technology. Kemptville: Ontario Ministry of Agriculture and Food, December 1975.

Madhill, J.E., and A.V. Skepasts. "Selecting a Perennial Forage." No. 75-054. Kemptville College of Agricultural Technology and New Liskeard College of Agricultural Technology. Kemptville: Ontario Ministry of Agriculture and Food, December 1977.

Moggach, G.S., and J.K. Weeden. "Large Package Hay Equipment: New Concept in Hay Making." No. 79-036. Toronto: Agricultural Engineers, Extension Branch, Ontario Ministry of Agriculture and Food, March 1979.

Ontario Ministry of Agriculture and Food. Proceedings of "Ontario Forage Conference," December 13 and 14, 1978, Toronto. Sponsored by Ontario Ministry of Agriculture and Food, Ontario Soil and Crop Improvement Association, and University of Guelph.

_____. "1980 Field Crop Recommendations." Publication 296. Toronto: The Ministry, 1980.

_____. "1980 Guide to Chemical Weed Control." Publication 75. Toronto: The Ministry, 1980.

Sheard, R.W. "Fertilizer Use in Forage Establishment." No. 78-061. Guelph: Department of Land Resource Science, Ontario Agriculture College, University of Guelph, June 1978.

_____. "Fertilizer Practices for Alfalfa Production." No. 70-008. Department of Land Resource Science, University of Guelph, September 1970 (reprinted March 1980).

METRIC CONVERSION TABLE

1 acre = 0.4047 hectare
1 pound = 0.4536 kilogram
1 ounce = 28.35 grams
1 imperial ton = 0.9072 tonne
1 imperial bushel = 0.0364 cubic metre
1 imperial gallon = 4.546 litres
1 imperial fluid ounce = 28.41 millilitres
1 foot = 0.3048 metre
1 inch = 2.540 centimetres

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